

ABSTRACTS OF PODIUM AND POSTER PRESENTATIONS

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On variability and the choice of model populations in the taxonomic assessment of early fossil hominids. R. ROGERS ACKERMANN, Dept. of Anthropology, Washington University, St. Louis, MO 63130.

Drawing taxonomic boundaries among early fossil hominids remains difficult due to the inherent problems with defining species based on morphology. This issue is mired in the epistemological distinction between differences of degree and kind; how much morphological distance is sufficient for two specimens to be considered different taxa? Making such distinctions is impeded by several obstacles, some of the most challenging being sexual dimorphism, small sample size, and the comparison of spatially and temporally delimited species. To overcome these obstacles, further attempts at delineation must be made taking into account the complexities of variation and population structure.

This study results in an understanding of morphological similarity between individual australopithecine faces within the context of specific extant population structures based on human, chimpanzee, and gorilla facial variability. Multivariate data collected within individual bones of the faces of *Australopithecus africanus*, *Australopithecus robustus*, and *Australopithecus boisei* is used to calculate Mahalanobis' distances between each fossil australopithecine. Variance/covariance matrices of known populations are used for evaluating distances between australopithecine specimens, in order to determine whether the variability in the australopithecine sample exceeds that of the known models. The known model populations consist of sub-specific, specific, and supra-specific populations of humans, chimpanzees, and gorillas; it is not suggested that human, chimpanzee, or gorilla faces are exact models for the australopithecine face--only that their variation might be good models for interpreting australopithecine variation. Frequency distributions created by comparing random pairs or sets of individuals within the model populations are used to test the significance of the fossil Mahalanobis distances and to assess levels of sexual dimorphism.

The resulting Mahalanobis distance matrices between all

individual australopithecines stand as a quantitative assessment of both the closeness of their mutual affinities, as well as the type or types of population they most likely represent. Additionally, the results of this study suggest that assumptions about early hominid population structure seriously affect conclusions about hominid relationships, throwing doubt on the reliability of any taxonomic conclusions.

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Patterns of variation within two samples of south-central European Neandertals. J.C.M. AHERN, J.D. HAWKS, and S.-H. LEE. Department of Anthropology. University of Michigan. Ann Arbor, MI 48109-1382.

The late Neandertal sample from Vindija (Croatia) has been described as transitional between the earlier Central European Neandertals from Krapina (Croatia) and modern humans. However, the morphological differences indicating this transition may rather be the result of different sex and/or age compositions between the samples. This study tests the hypothesis that the metric differences between the Krapina and Vindija supraorbital samples are due to sampling bias. We focus upon the supraorbital region because past studies have posited this region of Vindija's morphology as particularly indicative of the sample's transitional nature. Furthermore, the supraorbital region varies significantly with both sex and age.

We analyzed six variables and nine derived indices of supraorbital torus form as defined by Smith and Ranyard (1980). For each variable and index, a normally distributed population based on the Krapina sample was created using a *Pascal* program written for this purpose. The lower half of this distribution was then resampled to determine the probability that the Vindija summary statistics could be drawn from a young age and/or female-biased subset of a Krapina-based population.

Our results show that when the Krapina sample is assumed to be random, the probability that the differences between the Krapina and Vindija supraorbital samples are due to different age/sex ratios is exceedingly low. The hypothesis that the observed differences are due to sampling bias can only be accepted when the Krapina sample is assumed to be all males/old and the Vindija sample is exclusively females/young. Thus evolutionary change rather than differences in sample composition offers the best explanation for the morphological differences between the Krapina and Vindija samples.

Demographic history and mtDNA sequence diversity in common chimpanzees. C. AHLSTROM, J. HAWKS, K. HUNLEY, and S. OH, Dept. of Anthropology, University of Michigan, Ann Arbor, MI 48109.

Mitochondrial DNA variation in common chimps greatly exceeds that of humans (Wise et al. 1997), with much of this variation manifested among, rather than within, three allopatric subspecies. The distribution of chimp mtDNA diversity led Morin et al. (1994) to suggest that chimpanzee demographic history was characterized by long-range gene flow within subspecies, but significant isolation between subspecies. Other factors, including recent population expansions and habitat fragmentation, have also been suggested as contributors to the current pattern of chimp mtDNA variation.

This study uses a nested cladistic analysis (Templeton et al. 1995) to determine the relative importance of these multiple demographic factors on the three subspecies of *Pan troglodytes*. Given an adequate geographical sampling design, this technique allows the use of haplotype geographic information to test the likelihood of different hypotheses about demographic history, such as restricted gene flow, range expansion, or genetic isolation. Additional predictions for demographic hypotheses are obtained through simulations using the coalescent algorithm (Hudson 1990). All tests are performed on a sample of 130 new or previously reported mtDNA control region I sequences from chimpanzees of known geographic origin.

Our results are consistent with the suggestion of gene flow within subspecies and partial isolation between subspecies of *P. troglodytes*. The observed differences between chimpanzee and human mtDNA diversity may reflect more restricted gene flow among chimp subspecies than among human geographic groups. Also, recent chimpanzee population expansion is ruled out as an explanation for species-wide variability. However, our

ability to differentiate among historical factors such as colonization or population fragmentation in chimpanzees is weakened by the inadequacy of the available geographic sample. Future sampling efforts should take care to incorporate a sampling design that adequately represents geographic variation in *P. troglodytes*.

The Expensive Tissue Hypothesis Revisited. L.C. AIELLO and N. BATES, Anthropology, University College London, Gower Street, London WC1E 6BT, England. T. JOFFE, Anthropology, George Washington University, Washington, D.C. 20052, U.S.A.

Aiello and Wheeler (1995) introduced the Expensive Tissue Hypothesis as an explanation for an apparent paradox in encephalization. Brain tissue is very expensive in energetic terms, but humans and other encephalized animals do not necessarily have relatively high basal metabolic rates to compensate for their relatively large brains. The Expensive Tissue Hypothesis proposes that the increased energetic cost of the encephalized brain must be balanced by a reduction in size (and energetic cost) of one or more of the other energetically expensive tissues in the body. Otherwise, there must be an elevated BMR with possible fitness consequences. In primates, including humans, data suggest that the energetic cost of the encephalized brain is balanced by a corresponding reduction in the size of the of the gastro-intestinal tract.

Tests of the Expensive Tissue Hypothesis in the Ungulates, Carnivores, Cetaceans and Pinnepeds demonstrate that there are a variety of strategies that different animals have adopted to balance the costs of encephalization and that these strategies tend to become more important as encephalization increases. There is no universal reciprocal relationship between relative brain size and relative gut size across all orders of animals. Analyses involving both allometry and the comparative method, however, support the hypothesis that some primates, and particularly humans, balance the energetic costs of their encephalized brains with a reduction in gut size. Data continue to support the hypotheses that in human evolution dietary change and the corresponding reduction of the size of the gut was an important 'prime releaser' in the context of hominid encephalization.

It is important to realise that the Expensive Tissue Hypothesis deals with the energy requirements of the brain in the adult and not the equally important, but different, question of energy demands of the prenatal and postnatal ontogeny of the brain (Martin 1996).

Neolithic Collapse in the Levant Viewed from Dental Enamel Hypoplasia. S. A. AL-ABBASI, Department of Anthropology, Arizona State University, Tempe, AZ 85287-2402 and I. SARIE', Palestinian Department of Antiquities, P.O. Box 870, Ramallah via Israel.

This study emphasizes a comparison of the prevalence and occurrence of Dental Enamel Hypoplasia (DEH) between

the Neolithic People of Ain Ghazal and Wadi Shu'eib in Jordan.

The study includes 584 teeth of 28 individuals from two periods (PPNB and PPNC) in Ain Ghazal; 125 teeth of 9 individuals from PPNB in Wadi Shu'eib are included in this comparison as well.

The same methodology was used to study the dentitions of both populations. Dental Enamel Hypoplasia was recorded for all permanent teeth with the type of defect classified as lines, grooves or pits.

The prevalence distribution of DEH in the PPNC dentition of the Ain Ghazal people (38.3%) is higher than that of the PPNB period (22%). On the other hand, the prevalence of DEH was found higher in Wadi Shu'eib dentitions (38.4%) than in Ain Ghazal dentitions of the same period (PPNB). Moreover, the occurrence of the grooves appears to be higher in the PPNC Ain Ghazal dentition (61.3%) than it is in the PPNB (38.5%). For the dentition of Wadi Shu'eib, the occurrence of the grooves is higher (68.8%) than in the dentition of Ain Ghazal from the same period.

This study displays the importance of reconstructing the health status of prehistoric populations to support archaeological evidence and interpretation. There is an indication of a health and nutritional deterioration in Ain Ghazal after the PPNB. However, DEH indicates that within the same period (PPNB) the health status of the Ain Ghazal people was better than that of their western neighbor, Wadi Shu'eib. These trends are consistent with the collapse theory of the Neolithic sites in the Levant after PPNB.

The effects of physical fitness on the structure of long bone diaphyses: A study of U.S. female Marine recruits. K. ALDRIDGE and C.B. RUFF, Dept. Cell Biology and Anatomy, and T.J. BECK, Dept. of Radiology and Radiological Sciences, Johns Hopkins Univ. Sch. Med., 725 N. Wolfe St., Baltimore, MD 21205

Previous comparative and experimental work has demonstrated that increased mechanical loading leads to strengthening of the skeleton, which suggests that individuals with habitually higher activity levels should have relatively stronger bones. We tested this hypothesis by comparing bone structural parameters in a large sample of female Marine recruits with known varying levels of physical fitness.

A total of 691 U.S. female Marine recruits underwent fitness testing and dual-energy X-ray absorptiometry (DXA) scans of the femoral midshaft, the distal third of the tibia, and the distal third of the fibula upon their arrival at Parris Island Marine Recruit Training Center in South Carolina. These women were of varying ethnicities, with ages ranging between 17 and 32, with an average age of 19.1 years. No attempt was made to control for ethnicity or age in this analysis. The DXA scan data were used to derive the cross-sectional area, moment of inertia, section modulus, and the width of each of the bones. The fitness testing consisted of a timed .75 mile run, the number of sit-ups accomplished in one minute, and the length of time each could hang in chin-up position above the bar.

After correcting for body size differences, results indicate that, in general, individuals with higher fitness levels display increased bone strength. However, the results vary by activity type and bone location. There were no significant

differences in the dimensions of the fibula in any analysis, as might be expected, given the more marginal role of the fibula in support of body weight. The most consistent effects were found in the relation of the structural data to the run scores--all structural parameters of the femur and tibia were significantly related to these scores. This result is also consistent with mechanical expectations as running is probably more directly related to prior mechanical loadings of the lower limb than are the more general fitness levels reflected in the sit-up and hang time performance. Our results also indicate that a difference in both endosteal and periosteal bone apposition may be involved in the structural effects observed.

This study sample is unique in that it includes structural data from a large group of healthy, young, modern human females. Results of this study provide evidence for the effects of physical activity on bone shape and structure in modern humans, and by implication, earlier hominids.

Work supported by a grant from the Defense Women's Health Research Program.

Fertility and Subadult Mortality at Semna South, Sudanese Nubia. A. ALVRUS, Department of Anthropology, Arizona State University, Tempe, AZ 85287-2402.

Fertility and subadult mortality may be particularly sensitive indicators of the general level of health and adaptation of a population to its environment. Although skeletal collections will always be imperfect reflections of the living population that produced them, paleodemographers may still be able to gain insight into past population structures and processes.

This paper presents demographic data for a Meroitic Nubian population from the site of Semna South in the *Batn el Hajar*, Sudan. There are slightly more females (n=260) than males (n=248). Life expectancy at birth was 28.9 years, and mean age at death was 24.2 years. Subadults compose 28.4% of the cemetery population. The majority of the deceased subadults had died between birth and two years of age.

This information is compared to published data from two later (Christian period) Nubian cemeteries from the site of Kulubnarti, also located in the *Batn el Hajar*. At Kulubnarti, much lower life expectancies (8.4 and 19.7 years) and larger percentages of subadults (75% and 51%) were found. Mean ages at death were 11.4 years and 18.2 years. The differences between Semna South and Kulubnarti may reflect higher fertility and/or subadult mortality at the Christian period site.

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Mandibular Morphology in Human Populations: An examination of primary muscle attachment and architectonic models for development of the ramus.

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Several explanatory scenarios for the absolute size of the human mandibular ramus have been proposed. Observed morphology has been explained under two distinct, though related models. Under the first model, the ramus is primarily regarded as a simple skeletal attachment point for the masticatory muscular requirements of the corpus. The second model focuses on the ramus as part of an integrated "architectonic" system encompassing the neurocranial and nasomaxillary regions as well.

Under the first scenario occlusal loading, dietary regime, and masticatory muscle force vectors are the prime movers of observed ramal morphology. Prediction of size may or may not include reference to ecogeographical patterning (Bergmann's and Allen's Rules). In contrast, architectonic modeling specifically addresses multiple craniofacial factors effecting occlusion. In this scenario, middle cranial fossa orientation cascade effects proceeding through the nasomaxillary complex underly observed morphology. Under this model no specific reference to dietary or ecogeographic factors is made. Model prediction requires African or African-derived mandibular rami to be broader than Caucasian, with cranial and nasomaxillary orientation in turn requiring Caucasian mandibular rami to be broader than Asian or Asian-derived.

To test this hypothesis, minimum breadth of the ramus was analyzed in several (n=7) geographically discreet extant and fossil populations. Results follow Hylander, 1977 in finding the broadest rami of extant human groups in Greenland Eskimos, which do not exhibit significant differences compared to Neandertals. The rami of northern Caucasian populations (Norwegians) are extremely large, yet at the same time, the narrowest rami are found in temperate European-derived populations. Results are contra a strict architectonic model which would predict African populations (Ugandans) to exhibit the largest morphology scaled to cranial size. Results indicate that neither clinically derived or simple muscle attachment models are individually able to encompass variation in the mandibular ramus. The suggestion is made that cranial fossa orientation and nasomaxillary models are valid within a context that includes ecogeographic and dietary regime factors as well.

Gross morphology and bone density patterns of the knee joint in arboreal quadrupeds. K AHLUWALIA, SUNY Stony Brook, NY, 11794-4364

Weight distribution across the tibial plateau is mainly dependent on the position of the line of the substrate reaction force (SRF) relative to the center of the knee joint. Arboreal primates have laterally directed SRFs (Schmitt, 1995). Because leaping arboreal species (e.g., *Presbytis* monkeys) locomote with adducted hindlimbs (Fleagle, 1977), it is expected that these primates will have increased loading on the lateral side of the knee. In contrast, non-leaping arboreal quadrupeds (e.g., *Trachypithecus*) locomote with abducted hindlimbs and tibiae that incline supero-laterally from the substrate. As a consequence, the SRF may pass medial to the knee center.

The loading history of the tibial plateau in leaping *Presbytis* monkeys (i.e., *P. melalophos* and *P. rubicunda*) and non-leaping *Trachypithecus* monkeys (i.e.,

T. obscura and *T. cristatus*) was investigated. A series of osteological measurements, chosen for their ability to affect the medio-lateral position of the knee joint or to reflect loading patterns, were taken on the femora and tibiae of these monkeys. Contour maps of subchondral cortical bone density in the tibial plateau of these same species were then created from density calibrated CT images. The region of maximum density, as revealed by these maps, corresponds to the point of maximum loading (Müller-Gerbl *et al.* 1989; 1992).

Results reveal that features related to medio-lateral joint loading can be used to distinguish these genera. The lateral tibial condyles of *Presbytis* monkeys have a larger surface area and a higher density maximum than the medial condyles. *Trachypithecus* species, however, have density maxima on their larger medial condyles. Therefore, leaping colobines predictably load the lateral side of their knees more than the medial, while the opposite is true for closely related, yet non-leaping, members of the same subfamily. It is thus possible to divide the category of generalised arboreal quadruped, often used in fossil descriptions, into leaping and non-leaping subsets.

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Cannibals in the Cooks?: Island Biogeography and Hominid Behavior. S. C. ANTÓN and D.W. STEADMAN, University of Florida, Gainesville, FL 32611.

The colonization of island ecosystems by humans often depletes indigenous floras and faunas. These biotic changes in turn influence the physical and behavioral development of humans. Modelling the forces that drive these interactions and their results is critical to understanding the composition and function of modern ecosystems and to establishing whether the arrival in island Southeast Asia of *Homo erectus* had human-like effects on indigenous faunas.

We test Kirch and Steadman's model for changes in human societies and biodiversity in remote Oceania. The model explains dietary shifts from early occupations subsisting on marine fish and birds through decreases in these foods due to overexploitation as agriculture increases and finally the decline of all resources with human overpopulation. Increasing resource stress is predicted to lead to warfare and cannibalism.

Our data from 7 rockshelter sites and 4 burial caves on the island of Mangaia, Cook Islands, South Pacific suggest support for the model as follows: 1) rockshelters provide evidence of faunal overexploitation including rapid bird extinctions, reduction in fish size, and use of peripheral foods such as rat. 2) burial caves and rockshelters yield different patterns of distribution and modification of human remains, and 3) the rockshelters include living sites as well as ritualistic/cannibalistic human processing sites; at living sites human and nonhuman bone exhibits similar patterns of modification with humans <8% of the assemblage. Alternatively, a

ritualistic site (MAN-84) presents few artifacts, no large fish or domesticates (pig, dog, chicken), and nearly 1500 isolated human elements from fetal to adult age, fragmented and associated with traditional ovens.

Support for the Kirch/Steadman model provides insight about prehistoric Mangaia and suggests that human behavior is modified by resource availability. The rapid rate of extinction of indigenous species following human arrival also suggests that post-*H. erectus* SE Asian faunas may not represent the natural biodiversity of the Indonesian Archipelago.

Using a college forum to teach evolution in a unique and non-threatening way. P.C. ASHMORE, Department of Anthropology, University of Missouri St. Louis, MO 63121.

In college classrooms, and more particularly within the classrooms of elementary and secondary schools, discussion of evolutionary topics often requires a teacher to traverse some very hazardous social and political terrain. Appropriate strategies for the negotiation of this terrain vary as do the complexities of increasingly intra and inter diverse student populations. At the University of Missouri St. Louis, the Department of Anthropology and the School of Education have embarked on a collaborative initiative to teach K-12 students about the origin of humans. Using the founding principle of holism and an evolutionary perspective, state of the art pedagogy has been combined with up to date content information in order to create a unique learning environment. This environment takes the physical form of a lab setting housed in the Anthropology Department, and is structured around a K-12 curriculum. Undergraduate anthropology and education students work either as volunteers or interns to develop and facilitate the learning experience. Incoming students and their teachers are put through a variety of learning stations in which a hands-on and highly interactive curriculum engages the students to learn about a variety of topics pertaining to evolution.

Results from both preevaluation and postevaluation instruments indicate that this approach is successful. Findings from the evaluations demonstrate improvement in students' content knowledge and positive shifts in attitude. This program allows our K-12 students and teachers to self discover a number of basic evolutionary concepts in a nonthreatening and dynamic learning environment.

The creation of this environment was achieved through the work of interdisciplinary faculty and college students. This collaboration has enabled us to identify positive strategies for the dissemination of potentially volatile information and knowledge. Therefore, this program is presented as a model for the teaching of evolution.

Dental Morphological Evidence for Population Affinities of the Iberian Peninsula (100 BC- 1300 AD) and Western Balearic Islands. SE BAILEY¹, CG TURNER II¹ and PH DU SOUICH². ¹Arizona State University, Department of Anthropology, Tempe, AZ 85287-2402 ²Laboratorio de Antropología - Facultad de Medicina, Granada, SPAIN 18012

The Iberian Peninsula has a fairly complex human population history, reflecting its geographic location and

local conditions. Understanding the biological affinities in this area is relevant to the broader issue of European dental variation. This study examines biological distance within Spain and the nearby Balearic Islands.

Our analysis is based on morphological observations of eight tooth crown variables of the standardized Arizona State University dental anthropology system (ASUDAS). The Spanish samples consist of data collected on two mainland and one island sample representing geographically distinct regions of Spain. These Spanish samples are then more broadly compared to published data on three additional samples representing Northwest Europe, North Africa, and Israel.

The mainland Spanish samples turn out to be statistically more similar to each other than either is to the island sample. This relationship is likely attributable to regionally different population histories. Founder's effect may also have affected the islanders of Menorca. Interestingly, each of the Spanish samples is dentally more like the North African sample than like the Northwest European sample. They are most different from the Israeli sample.

The known population history of Spain and results from this study support the view that the Spanish mainland samples were likely influenced by North African admixture. This study also suggests that Europe is not dentally homogeneous. These findings should be taken into consideration as the concept of a "European" dental complex undergoes refinement.

Shape and size differences between Tibetan children in Tibet and China. S.M. BAILEY, Tufts Univ, Medford, MA 02155, and X. HU, Chengdu Institute of Sports, Chengdu, PRC.

Tibetan children aged 11-14 living at comparable altitudes in northern Sichuan, China, and in Lhasa, Tibet, and above 4000 m in eastern Tibet, were measured for height, weight, arm circumference, and chest circumference. Lung capacity also was collected for the Sichuanese children and the higher altitude Tibetan group. These analyses used twoway ANOVA with covariance adjustment of age.

Lhasan boys were significantly larger, by over 5 cm in height and 3 kg in weight, than Chinese Tibetan boys, with 4 cm larger chest circumferences. The higher altitude Tibetan boys were 2 cm shorter, 4 kg lighter, and had 2 cm smaller chests than Sichuan peers. Sichuanese Tibetan girls, by contrast, were over 1 cm larger in height and chest circumference and 3 kg heavier than the other groups' females. Both sexes in Sichuan also had larger upper arms.

Although lung capacity was larger in the Sichuanese sample, by about 60 cc in boys and 340 cc in girls, chest circumference to height ratios did not differ significantly among the children.

These data indicate that body shape is conserved among the three groups. However, prepubescent children in Tibet show significant sex differentials in growth not seen in the Chinese sample, and in a direction suggesting gender effects in nutrition or health.

Treponematoses in the Northeastern U.S. before and after 1492. B.J. BAKER, New York State Museum, 3122 CEC, Albany, NY 12230.

Only two published reports of treponematoses exist for the region encompassing New England, New York, New Jersey, and Pennsylvania. One case from the Mohawk Valley of New York is prehistoric (Elting and Starna 1984). The other is an individual from an historic Seneca cemetery in western New York, whose cranial morphology suggests she may have been of African descent (Wray et al. 1991).

Recent examinations of prehistoric and historic Native American skeletal collections from the region have revealed at least five additional cases of possible treponemal infection. Three are from prehistoric sites in the Hudson and Mohawk River valleys, including the fragmentary skeleton of an old adult female with postcranial lesions. A more complete skeleton of a probable male adult shows extensive resorption in the palate and postcranial involvement consistent with Hackett's (1976) diagnostic criteria "on trial." In addition, a 35-45 year old male represented only by a cranium displays lesions resembling partly healed circumvallate cavitations and radial scars, pitting of the palate, and slight remodeling of the nasal margins (Baker 1996).

After 1492, there is no discernible increase in the frequency of treponematoses in Native American skeletal assemblages from the Northeast. A cranium of a probable male adult from a Susquehannock site in Pennsylvania, dating from 1575 to 1600, shows radial scars (Gagnon 1996). Another cranium of an adult male from the historic Seneca site of Boughton Hill (1670-1687), in western New York, exhibits possible radial scars. In addition, the skeleton of a non-native soldier from Fort William Henry (1755-1757) in Lake George, NY, displays severe tibial changes from either treponematoses or nonsuppurative osteomyelitis. All cases of treponematoses known in the Northeast are adults. No evidence of congenital transmission exists.

Phylogenetic relationships and functional morphology of the distal humerus from Kanapoi, Kenya. E.W. BAKER, A.A. MALYANGO and T. HARRISON, Dept. of Anthropology, New York University, New York, NY 10003.

Previous comparisons of the distal humerus from Kanapoi (KNM-KP 271), a paratype of *Australopithecus anamensis*, have tended to stress the morphological similarities of the fossil to *Homo*. A critical reassessment of the morphological affinities of the Kanapoi distal humerus has provided important new evidence with implications for interpreting the phylogenetic relationships and possible functional attributes of the forelimb of *A. anamensis*. The results of the present study confirm that KNM-KP 271 does indeed share features which are unique to hominins, but it is also much less human-like than previous studies have inferred.

Features in which the fossil most closely resembles *Homo* include: caputular surface expanded anteriorly and less extensive distally; truncation of the capitulum mediolaterally; outline in distal view of the posterior margin of the capitulum; less pronounced lateral trochlear keel; reduction in the steepness of the lateral wall of the olecranon fossa; and presence of a prominent tubercle (the "Hershkovitz tubercle") on the ridge separating the radial and coronoid fossae. This latter feature is apparently an important synapomorphy distinguishing hominins from all other hominoids. Dissections of human cadavers demonstrate that the "Hershkovitz tubercle" is not directly associated with the anterior capsular ligament (*contra* Leakey et al., 1995), but appears to represent an osteophytic contact with the head of the radius during hyperflexion at the elbow. It is postulated that the Hershkovitz tubercle is part of a functional complex, along with the greater anterior expansion of the capitulum, that is unique to hominins, and associated with increased flexion at the elbow and enhanced rotation of the forearm while in flexed positions.

It is of significance that several of the derived features shared by KNM-KP 271 and *Homo* are apparently not present in *Praeanthropus africanus* (= *Australopithecus afarensis*). This may indicate that *A. anamensis* is more closely related to *Homo*. KNM-KP 271 also shares several primitive features with *Pan troglodytes*. These include the medial location of the maximum anteroposterior thickness of the distal humeral shaft, a more pronounced lateral trochlear keel, and greater projection of the lateral epicondyle.

The distinctive mosaic of features observed in KNM-KP 271 suggests that *A. anamensis* may have had a behavioral repertoire unlike that observed in any of the extant hominoids. The features that the Kanapoi humerus shares with *Pan troglodytes* might imply that the forelimb was used more extensively for locomotion than in humans, while the specializations shared uniquely by hominins might be related to changes in forelimb function and use that are correlated with the initial development of bipedalism.

Maxillary sinusitis in an elderly population from the Texas State Cemetery. J. E. BAKER, Department of Anthropology, Texas A&M University, College Station TX 77843-4352, and H. D. DOCKALL, U. S. Army Central Identification Laboratory, Hawaii (CILHI), Hickam Air Force Base HI 96583-5530.

Renovations at the Texas State Cemetery in Austin resulted in the excavation of the skeletal remains of 50 Confederate veterans and six spouses during the summer of 1995. All of the individuals were elderly, ranging in age from 60 to 95 years old, with an average age at death of 76.7 years (based on headstone data). This skeletal sample

provides an important opportunity to explore health issues, through the examination of chronic maxillary sinusitis, from the antebellum through post-reconstruction eras.

Active and healed periosteal lesions of various degrees were evident in eight of 43 individuals (18.6%) with at least one observable sinus chamber. A total of 78 maxillary chambers could be examined. Of these, 12 chambers (15.4%) had evidence of sinusitis in the form of spicules, remodeled spicules, or white pitted bone. These lesions typically occur when infections due to *Staphylococcus*, *Streptococcus*, or *Actinomyces* stimulate osteoblasts. Viral infections, such as the common cold, may result in maxillary sinusitis as well. Environmental factors also play a role in the development of sinusitis. Inadequate housing, overcrowding, malnutrition, generally poor health, cold winds, and air quality have been linked to the development of this condition.

The rate of maxillary sinusitis in this sample is low, particularly when compared to other historic populations. The relative rarity of this condition may be due to living conditions, since many of the men were lifelong rural farmers infrequently exposed to the predisposing factors of sinusitis associated with city dwelling. This situation changed later in life, since most of the men were residents of the Confederate Home for Men in Austin at the time of their deaths. Declining health, poor air quality, and the fast spread of infectious agents, particularly among an elderly institutionalized population, may have contributed to the two cases of active sinusitis.

Examinations of environmental and social factors particular to the Texas State Cemetery sample provide insight into the prevalence of maxillary sinusitis in the past.

What happens to infants who sleep with their parents? H.L. BALL and E. HOOKER, Department of Anthropology and UCS, University of Durham, Durham DH1 3HN, UK.

Research in US and UK sleep labs. has demonstrated that a close behavioural and physiological relationship exists between mother-infant co-sleeping pairs which may protect infants against SIDS. In previous studies we found that most co-sleeping infants in the North Tees area of England are brought into bed with both parents. Here we present the initial results of an in-home observation study examining what happens to infants sleeping with both parents.

Using low-light video cameras and infra-red lights we obtained all-night videos of co-sleeping parents and infants. Videos were coded using a behavioural taxonomy which allows us to quantify data on parent-infant sleeping positions, proximity, orientation, and frequency and duration of interactions and interventions. Results presented are based on 80 hours of video-taped observations comparing five infants sleeping with their mothers only, and with both parents. On both triadic and dyadic sleeping nights infants spent the majority of the night oriented towards the mother, regardless of the proximity or position of the father. Infants were also commonly observed in closer proximity to the mother than the father, and on triadic nights fathers were found to orient themselves away from the mother-infant pair. Mothers

responded both more rapidly, and more frequently, to infants than did fathers. Differences observed between mother-infant interactions on the triadic and dyadic co-sleeping nights were minimal. These preliminary data suggest that the presence of the father in the bed has a negligible influence on the night-time relationship which exists between co-sleeping mothers and infants.

We also examined the video-tapes for indications that sleeping with both parents may carry more risks for the infant than sleeping with the mother alone. All infants slept between both parents on triadic sleeping nights, and all were placed in a supine position. Using interval sampling we coded the position of bedding, pillows and parents relative to the infant's body, head and face in both co-sleeping situations. Quantification of the frequency of potential infant-risk events (smothering, overheating, rebreathing CO₂) indicates that infants were not at increased risk when sleeping between both parents versus sleeping with the mother only.

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MtDNA and Y chromosome variation in South Indian populations. M. BAMSHAD, Department of Pediatrics, University of Utah, Salt Lake City, UT 84112. W.S. WATKINS, Department of Human Genetics, University of Utah, Salt Lake City, UT 84112. B. BHASKARA RAO, J.M. NAIDU, Andhra University, Visakhapatnam, India. B.V.R. PRASAD, Andhra University, Visakhapatnam, India. Anthropological Survey of India, Calcutta, P.G. REDDY, University of Madras, India. C. WATKINS, Department of Human Genetics, University of Utah, Salt Lake City, 84112. A. RANANAYAGAM, M.F. HAMMER, Laboratory of Molecular Systematics and Evolution, University of Arizona, Tucson, AZ 85721. L.B. JORDE, Department of Human Genetics, University of Utah, Salt Lake City, UT 84112.

We have analyzed mtDNA and Y chromosome polymorphisms in 300 unrelated males from 12 populations spanning the Hindu caste hierarchy. Estimates of mtDNA HVS1 sequence diversity range from 0.007 in the Vysya to 0.019 in the Relli, and the Gst estimate among caste populations is 0.09 ($p < 0.05$). mtDNA haplotype networks reveal a starlike branching pattern with few caste specific clusters. Mismatch distributions from each caste are smooth, unimodal, and suggest more than 100-fold expansion in the last 12,000 to 120,000 years. These expansions pre-date establishment of the caste system.

Stratification into upper, middle, and lower castes reveals a positive correlation between social rank and mtDNA diversity. Furthermore, the mtDNA genetic distance between upper and lower castes is the highest among caste groups. In contrast, Y chromosome trees reveal long central branch lengths and the genetic distances are not correlated with social rank. The mantel correlation between the Y STR and mtDNA distance matrix is 0.14 ($p > 0.30$). This suggests that a sex-specific gene flow pattern may exist. This may be due to restricted male or higher female intercaste mobility.

Castes are compared to mtDNA haplotypes from 250 males distributed among 14 South Indian tribal groups and 300 individuals from continental populations. MtDNA diversity varies widely and mismatch distributions are multimodal. An intergenic *COII/IRNALys* 9-bp deletion is observed in 5 tribal populations. Phylogenetic and mismatch analyses suggest an independent origin in India. Caste and tribal affinities to Asian populations are higher than to Caucasians.

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Skeletal maturation and environmental stress in ancient Nubian teenagers and young adults. A.M. ALBERT BAPTISTA, Department of Sociology and Anthropology, UNC-Wilmington, Wilmington, NC 28403-3297, and D.P. VAN GERVEN, Department of Anthropology, University of Colorado at Boulder, Boulder, CO 80309-0233.

This research assessed the magnitude of variability in skeletal growth and maturation in teenage and young adult skeletons. It was hypothesized that environmental stress, such as nutritional deficiencies, may lead to disruptions in the timing and or pattern of epiphyseal union. This was tested by examining skeletal remains from two Nubian cemetery populations, where it has previously been demonstrated that the early Christian period (550-750 AD) population was more stressed than the late Christian period (750-1450 AD) population.

Large discrepancies in the timing and pattern of epiphyseal union, compared to the normal variation occurring in modern, healthy individuals, would suggest that skeletal growth and maturation were disrupted by environmental stress. In this study, we examined how environmental stress affected skeletal growth and maturation specifically in teenage and young adult skeletons.

As many as 66 separate skeletal sites of epiphyseal union were examined for each of 90 individuals (aged 11 to 31 years) in the sample. Results supported the above hypotheses in that Early Christian period skeletons generally exhibited skeletal maturation delays when compared to the late Christian period skeletons. Both cemetery samples showed disturbances in skeletal maturation when compared to standards derived from contemporary, healthy US samples. Thus, disturbances in skeletal maturation may be considered an indication of environmental stress active in teenagers and young adults around the time of death.

Health differences between settled and nomadic Turkana men. NL BARKEY, BC CAMPBELL, Northwestern University, Evanston IL 60208, and PW LESLIE, University of North Carolina, Chapel Hill, NC 27599.

A comparison between pastoral Turkana and their kin who have adopted a sedentary, agricultural life, provides fundamental insight into the sedentarization process. The health consequences of the transition to agriculture are one reflection of the costs associated with changes in diet, physical activity levels, ecological niche and social organization. This study examines the patterns of health complaints of settled and nomadic Ngisonyoka, Turkana, and possible explanations for the contrasts between them.

A sample of 154 nomadic and 129 settled men, age 14 and over, were surveyed in 1992 and 1993 as part of a survey of male reproductive ecology. Respondents provided information about their health status, dietary intake, demographic information, and several anthropometric measurements were taken.

The pattern of disease we found concurs with previous studies of health among Turkana: respiratory tract infections and eye infections are primary complaints. Parasitic

infections were lower than expected. Most of the specific health complaints increased with age, except spleen pain, which may be a sign of increasing immunity to malaria.

The settled Turkana reported more serious complaints in response to questions about their general health on the day of the interview, and in the previous month ($p < 0.01$). Specifically, the settled men reported higher rates of infectious disease compared to nomads, including a significantly higher proportion of cough (88% vs. 41%), eye (50% vs. 26%), and chest complaints (49% vs. 22%). Although the settled males had slightly higher BMI and indicators of body fat, none of the measures of body composition were predictive of any health complaint.

Our results suggest that the settled Turkana males are sicker than nomads, despite greater access to food and 'western' medical services. Differences in dietary composition, exposure to disease pathogens, physical activity and psychosocial stress are possible contributing factors. Future analyses should address the role each of these plays in the increased disease burden of pastoralists as they make the transition to a sedentary lifestyle.

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Within and between group social encounters among white-handed gibbons (*Hylobates lar*) in Khao Yai National Park, Thailand. T. Q. BARTLETT, Department of Anthropology, Dickinson College, Carlisle, PA 17013

Gibbons are small arboreal apes which live in monogamous social groups of 2-7 animals. Because of small group size and territoriality the number of potential social partners is assumed to be limited relative to other primate species. Moreover, most encounters between social groups are assumed to be agonistic. Consequently, the majority of literature on gibbons relates to their social organization and ecology. Discussions of gibbon social behavior are limited.

From Jan. 1994 to Jan. 1995 the socio-ecology of two previously habituated gibbon social groups was studied as part of continuing research on white-handed gibbons (*Hylobates lar*) in Khao Yai National Park, Thailand. In addition to the two main study groups four other groups had habituated members. During full day follows I recorded the occurrence of both intra- and inter-group social interactions. Social behavior was classified as wrestle play, chase play, grooming, and social contact. All categories of social behavior were recorded both between members of the same group and between individuals from neighboring groups. Young gibbons, especially, turn to other groups to find social partners. Because inter-group social encounters were

observed only between those groups with habituated members it is possible that prior research has underestimated the overall level of gibbon sociality.

The occurrence of social interactions between family groups may help interpret recent findings concerning the variation of gibbon social organization.

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Unmasking an Eocene primate enigma: the true identity of *Hoanghoniuss stehlinii*. C. BEARD, Vertebrate Paleontology, Carnegie Museum of Natural History, Pittsburgh, PA 15213.

Since its initial description by Zdansky (1930) as the first Eocene primate from China, the phylogenetic position of *Hoanghoniuss stehlinii* has been the subject of heated debate among paleoprimatologists. Virtually all possibilities have been advocated, so that *Hoanghoniuss* has been considered an adapiform, an omomyid, or a basal anthropoid at one point or another by various authorities. Much of this disagreement stems from the fact that, until now, phylogenetic reconstructions for this taxon have been largely unconstrained by anatomical data. Previous knowledge of *Hoanghoniuss stehlinii* has been limited to the holotype left mandible bearing M₂₋₃ and an isolated upper molar, probably M₂.

Renewed field work at the type locality for *Hoanghoniuss stehlinii* by joint crews from CMNH and IVPP (Chinese Academy of Sciences, Beijing) has led to the recovery of numerous additional specimens of this Eocene primate, including its entire lower dentition and much of its upper dentition. The type locality, located near the village of Zhaili on the northern bank of the Yellow River in southern Shanxi Province, China, occurs in freshwater limestones of the Zhaili Member, Heti Formation, thought to be late middle Eocene in age.

The presence of a double-rooted P₂ in *Hoanghoniuss* is a primitive retention that has been transformed in all living and fossil haplorhine primates, including such basal omomyids as *Steinius* and *Teilhardina*. This fact alone argues that *Hoanghoniuss* is not a haplorhine and is probably an adapiform. The latter possibility is confirmed by synapomorphies of the upper and lower dentition that link Eocene *Hoanghoniuss* with Miocene sivaladapid primates from India, Pakistan, and Yunnan Province, China. Accordingly, the sivaladapid clade can now be traced from the late Miocene to the late middle Eocene. Sivaladapids were an endemic Asian radiation of strepsirhine primates that persisted for some 30 million years before succumbing to extinction near the time that colobine monkeys invaded Asia from Africa.

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Phylogenetic relationships among the Atelinae based on mtDNA analysis. COLLINS, A.C.*†; DUBACH, J.*† and LEUTENEGER, W.*‡; Dept. of Anthropology, University of Wisconsin - Madison, WI, 53706 *and Dept. of Conservation Biology, Brookfield Zoological Society, Chicago, IL, 60513†‡

Most authors agree that the genera *Alouatta*, *Lagothrix*, *Ateles* and *Brachyteles* are monophyletic descendants of a single common ancestor, constituting the subfamily Atelinae. As a general rule these genera share: 1) large body size. 2) a prehensile tail, with a ventral grasping surface, and 3) frequent suspensory behavior. In other aspects of morphology and behavior they are quite diverse.

Phylogenies based upon morphological evidence seem to support most possible relationships among the Atelinae. Kay et al. (1990), analyzed dental traits to place *Alouatta* and *Brachyteles* as sister taxa, leaving *Lagothrix* and *Ateles* as sister taxa. Dunlap et al. (1985) link *Alouatta* and *Lagothrix* based on forelimb muscle comparison with *Ateles* as the outgroup. Ford's (1986) study based on a suite of various morphological traits suggests an unresolved trichotomy among *Ateles*, *Lagothrix* and *Brachyteles*; with *Alouatta* as the outgroup. Rosenberger and Strier (1989), suggested *Alouatta* as the most primitive genera followed by *Lagothrix* with *Ateles* and *Brachyteles* as sister taxa. All of these morphological studies reach different conclusions and lack consensus.

Schneider et al. (1993) examined Platyrrhine relationships based on the DNA sequence of E-globin genes. This study supported a new alternative: *Alouatta* as the most primitive Atelinae with *Ateles* forming a clade along with the sister taxa of *Lagothrix* and *Brachyteles*.

The present study attempts to resolve Atelinae phylogenies by examining mitochondrial DNA variation. The results of examining DNA sequence for both the hypervariable portion of the D-loop and the COII gene are presented here.

The phylogenetic tree produced using parsimony analysis (PAUP Vs. 3.0), supports *Alouatta* as the most primitive genera with *Brachyteles* and *Lagothrix* as sister taxa joined in a clade with *Ateles*. Trees with either *Lagothrix* or *Brachyteles* as sister taxa to *Ateles* require 4 or 5 extra steps respectively. A tree grouping *Brachyteles* with *Alouatta* as sister taxa requires 4 extra steps as well. Neighbor Joining analysis (PHYLIP Vs. 3.457), also supports *Lagothrix* and *Brachyteles* as sister taxa, but is unable to relate either *Ateles* or *Alouatta* more closely to this clade.

These results are consistent with those of Schneider et al. (1993) based on nuclear DNA and thus reinforce one another. It is possible that the separation between the lineages leading to *Lagothrix*, *Brachyteles* and *Ateles* was very nearly a trichotomy, thus, acting to explain some of the discrepancies among the morphological phylogenies.

Endocranial capacity of Stw 505 ("Mr. Ples"), a large new hominid cranium from Sterkfontein. G. CONROY¹, A. KANE¹, H. SEIDLER², G. WEBER², P. TOBIAS³ ¹Washington University, St. Louis, MO; ²University of Vienna, Austria; ³University of the Witwatersrand, Johannesburg

In 1989 a large hominid cranium, Stw 505, was recovered in situ from Member 4, Sterkfontein. The specimen preserves much of the face and left side of a large adult male cranium and is the most complete hominid cranium recovered from Sterkfontein since the discovery of "Mrs. Ples" (Sts 5) just over 50 years ago. Although the skull has not been formally described, it has been figured in the literature as an

example of *A. africanus* and is widely (but anecdotally) reported to have an endocranial capacity in excess of 600cc (Johanson and Edgar, 1996). If true, such brain size would be remarkable in any early hominid dated to approximately 2.8-2.5 mya, especially since it would exceed other *A. africanus* endocranial values by over 100cc and would approximate or even exceed the endocranial values of several early *Homo* specimens from both Olduvai and Koobi Fora nearly 500,000 -1,000,000 years younger in age (e.g., OH 16, OH 24, KNM-ER 1805, KNM-ER 1813).

In order to evaluate the endocranial capacity of this remarkable, though incomplete, specimen, we first produced a computer generated (volume rendered) image of the complete skull (assuming bilateral symmetry) from CT data using the program ANALYZE™. From these data the enclosed endocranial space could also be rendered as a separate 3D object and its volume calculated directly. These analyses, combined with direct water displacement tests using a detailed cast and stereolithographic model indicate that the true endocranial capacity is far less than the reported 600' cc, and is more probably between about 500-530cc (allowing for some plastic deformation of the cranial vault). The latter value exceeds the largest value for 6 *A. africanus* crania so far determined or estimated, namely that of Sterkfontein hominid 5 ("Mrs. Ples") with a capacity of 485 cc. If Stw 505 is included in *A. africanus*, endocranial capacity for the species would now range from 425-515 cc (taking the mid-value of the range of estimates for Stw 505), with a mean of 451 cc, S.D. of 34.96 cc and C.V. of 7.75%.

Syphilis? Not quite: paleoepidemiology in an evolutionary context in the Midwest. D. C. COOK, Anthropology, Indiana University, Bloomington, IN 47405

Periosteal lesions resembling syphilis have been reported in ancient North American remains for over a century. The identity of the disease or diseases responsible is explored using epidemiological methods. Age-specific frequencies of cranial lesions, tibial periostitis and osteitis, periosteal reaction in other regions, and cortical bone loss are examined in Archaic (N=22), Middle Woodland (N=216), Late Woodland (N=265) and Mississippian (N=310) samples from closely related sites in Westcentral Illinois. Models derived from medical literature pre-dating antibiotic use are applied to these data. Lesions are generalized in distribution. Symmetry of involvement is common. Cranial, nasal, tibial, and other lesions are associated in individuals, and lesion frequency is high in all age groups. Frequencies peak in early childhood and in old age. Lesions characteristic of venereal syphilis are absent, and suppurative lesions are uncommon. These findings suggest that endemic treponematoses accounts for the observed pattern. Small contributions from traumatic causes can be

differentiated, but evidence for pyogenic osteomyelitis is rare. Age-specific distribution resembling endemic syphilis rather than yaws is more common in the later, maize dependent components in the study, perhaps because of nutritional deficiencies superimposed on the treponematoses pattern, and perhaps because tuberculosis appears in the region as maize becomes important.

Implications for theories of the origins of the treponematoses and for the health of the prehistoric inhabitants of Illinois are discussed.

Body size and shape of a Bridger C notharctine primate: adaptive implications. H.H. COVERT and J. HARRIS, Department of Anthropology, University of Colorado, Boulder, CO 80309-0233 and B.A. PAYSEUR and C.J. VINYARD, Department of Cell and Molecular Biology, Northwestern University, Chicago, IL 60611.

While skeletons of Bridgerian notharctines have been well known for 80 years, details of their locomotor and postural behaviors are still debated. For example, Gebo (1985) argued that the metatarsal morphology of notharctines indicates that they were incapable of frequent vertical clinging postures. More recently, MacLarnon (1996) has suggested that spinal canal morphology of notharctines may indicate that they were less acrobatic in locomotor behavior than modern primates. Here we report on the adaptive significance of the size and proportions of a nearly complete skeleton of a Bridger C *Notharctus* (CM 11910).

Fourteen forelimb and sixteen hindlimb measurements of *Notharctus* were compared with those of four extant Malagasy primates (*Propithecus verreauxi*, *Varecia variegata*, *Lemur catta*, and *Eulemur fulvus*). These modern primates exhibit a range of locomotor and postural adaptations with *Propithecus* being an acrobatic vertical climber and leaper, *Varecia* being a fairly deliberate arboreal quadruped which infrequently utilizes vertical structures, and *Lemur* and *Eulemur* being somewhat intermediate in these behaviors. In overall size, CM 11910 most closely resembles *Propithecus* and *Varecia*. Further, in many body proportions *Notharctus* most closely resembles *Propithecus*. Important similarities include an intermembral index of 62.9, a crural index of 84.5, and a lateral condyle height index of 102.8. *Notharctus* is distinctive from *Propithecus* in having a lower brachial index (97.5) and a more robust forelimb; *Notharctus* more closely resembles *Varecia* in both of these features. When all measurements are considered together, CM 11910 has a slightly smaller forelimb and slightly larger hindlimb than *Varecia*. In contrast, *Notharctus* has a slightly larger forelimb and slightly smaller hindlimb than *Propithecus*. These data are consistent with hypotheses suggesting that *Notharctus* utilized leaping locomotor behaviors at a frequency intermediate to that of *Varecia* and *Propithecus*.

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